

Claims

What is claimed is:

1. A condensate removal system for removing condensate from an electronics cooling system, said condensate removal system comprising:
 - a condensate collector for collecting liquid condensate from the electronics cooling system;
 - a vaporizing chamber in fluid communication with the condensate collector for receiving collected liquid from the condensate collector;
 - a vaporizer for vaporizing collected liquid within the vaporizing chamber;
 - and
 - a vapor exhaust in gaseous communication with the vaporizing chamber for venting vapor from the vaporizing chamber outside the electronics cooling system and condensate removal system.
2. The condensate removal system of claim 1, wherein a lower surface of the condensate collector is tapered from a first end towards a second end so that liquid condensate flows from the second end to the first end, and wherein the vaporizing chamber comprises a vaporizing compartment disposed at the first end of the condensate collector, the vaporizing compartment having liquid entry slots disposed in a lower portion thereof for receiving collected liquid from the condensate collector.
3. The condensate removal system of claim 1, wherein the vaporizer comprises a liquid heater, and wherein the condensate removal system further comprises at least one liquid level sensor for sensing level of collected liquid within the vaporizing chamber.

4. The condensate removal system of claim 1, further comprising a controller for automatically controlling operation of the vaporizer based on a level of liquid within the vaporizing chamber as detected by at least one liquid level sensor disposed within the vaporizing chamber.

5. The condensate removal system of claim 4, wherein the at least one liquid level sensor comprises an upper liquid level sensor for signaling the controller when an upper liquid level is reached within the vaporizing chamber, causing the controller to activate the vaporizer, and a lower liquid level sensor for signaling the controller when a lower liquid level is reached within the vaporizing chamber, causing the controller to deactivate the vaporizer.

6. The condensate removal system of claim 1, wherein the electronics cooling system comprises an air-to-liquid heat exchanger for air cooling an electronics rack and wherein the condensate collector is disposed beneath the air-to-liquid heat exchanger for collecting liquid condensate therefrom.

7. The condensate removal system of claim 1, wherein the vaporizer comprises an actively controlled vaporizer disposed within the vaporizing chamber.

8. A combined air/liquid enclosed apparatus for cooling rack-mounted electronic equipment, comprising:

a rack unit comprising a plurality of removable drawer units each containing an electronic unit;

a cabinet encasing the rack unit;

an air-moving device for moving air within the cabinet encasing the rack unit;

an air-to-liquid heat exchanger mounted within the cabinet; and

a condensate removal subsystem for removing liquid condensate from the air-to-liquid heat exchanger, the condensate removal subsystem comprising:

a condensate collector for collecting liquid condensate from the air-to-liquid heat exchanger;

a vaporizing chamber in fluid communication with the condensate collector for receiving collected liquid from the condensate collector;

a vaporizer for vaporizing collected liquid within the vaporizing chamber; and

a vapor exhaust in gaseous communication with the vaporizing chamber for venting vapor from the vaporizing chamber outside the cabinet.

9. The apparatus of claim 8, wherein a lower surface of the condensate collector is tapered from a first end towards a second end so that liquid condensate within the condensate collector flows from the second end towards the first end, and wherein the vaporizing chamber comprises a vaporizing compartment disposed at the first end of the condensate collector, the vaporizing compartment having liquid entry slots disposed in a lower portion thereof for receiving collected liquid from the condensate collector.

10. The apparatus of claim 8, wherein the vaporizer comprises an actively controlled liquid heater disposed within the vaporizing chamber for heating collected liquid therein, and wherein the condensate removal subsystem further comprises at least one liquid sensing level sensor for sensing level of collected liquid within the vaporizing chamber.

11. The apparatus of claim 8, further comprising a controller for automatically controlling operation of the vaporizer based on a level of liquid within the vaporizing chamber as detected by at least one liquid level sensor disposed within the vaporizing chamber.

12. The apparatus of claim 11, wherein the at least one liquid level sensor comprises an upper liquid level sensor for signaling the controller when an upper liquid level is reached within the vaporizing chamber, causing the controller to activate the vaporizer, and a lower liquid level sensor for signaling the controller when a lower liquid level is reached within the vaporizing chamber, causing the controller to deactivate the vaporizer.

13. The apparatus of claim 8, wherein the condensate collector of the condensate removal subsystem is disposed beneath the air-to-liquid heat exchanger, the vaporizing chamber is disposed within the condensate collector and the vaporizing chamber has a cover sloped to direct condensate impinging on the cover into the condensate collector.

14. A method of removing condensate from an electronics cooling system, the condensate removal method comprising:

collecting liquid condensate from the electronics cooling system in a condensate collector;

forwarding collected liquid from the condensate collector to a vaporizing chamber in fluid communication with the condensate collector;

vaporizing collected liquid within the vaporizing chamber; and

exhausting vapor from the vaporizing chamber to outside the electronics cooling system employing a vapor exhaust in gaseous communication with the vaporizing chamber.

15. The method of claim 14, wherein a lower surface of the condensate collector is tapered from a first end towards a second end so that liquid condensate flows from the second end to the first end, and wherein the vaporizing chamber comprises a vaporizing compartment disposed at the first end of the condensate collector, the vaporizing compartment having liquid entry slots disposed in a lower portion thereof, and wherein the forwarding comprises forwarding by gravity collected liquid within the condensate collector to the vaporizing compartment via the liquid entry slots.

16. The method of claim 14, wherein the vaporizing comprises employing a liquid heater disposed within the vaporizing chamber, and wherein the method further comprising sensing a level of collected liquid within the vaporizing chamber.

17. The method of claim 14, wherein the vaporizing comprises employing a vaporizer, and wherein the method further comprises automatically controlling operation of the vaporizer based on a level of liquid within the vaporizing chamber.

18. The method of claim 17, wherein the level of liquid within the vaporizing chamber is sensed by an upper level liquid sensor and a lower level liquid sensor, wherein the automatically controlling comprises activating the vaporizer when liquid within the vaporizing chamber reaches the upper liquid level, and deactivating the vaporizer when liquid within the vaporizing chamber falls below the lower liquid level.

19. The method of claim 14, wherein the electronics cooling system comprises an air-to-liquid heat exchanger for air cooling an electronics rack, and wherein the collecting comprises disposing the condensate collector beneath the air-to-liquid heat exchanger for collecting liquid condensate therefrom.

20. The method of claim 14, wherein the vaporizing comprises employing a vaporizer disposed within the vaporizing chamber, and wherein the method further comprises actively controlling operation of the vaporizer to remove collected liquid from the vaporizing chamber.

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